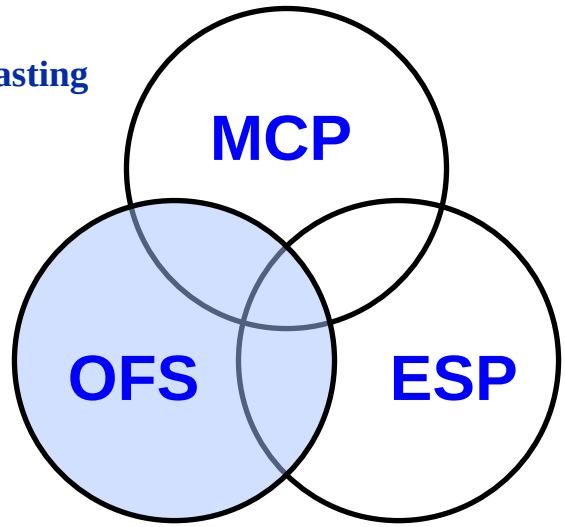
NWSRFS
Operational Forecast System

- Manual Calibration Program (MCP) system
- Operational Forecast System (OFS)
- Ensemble Streamflow Prediction (ESP) system

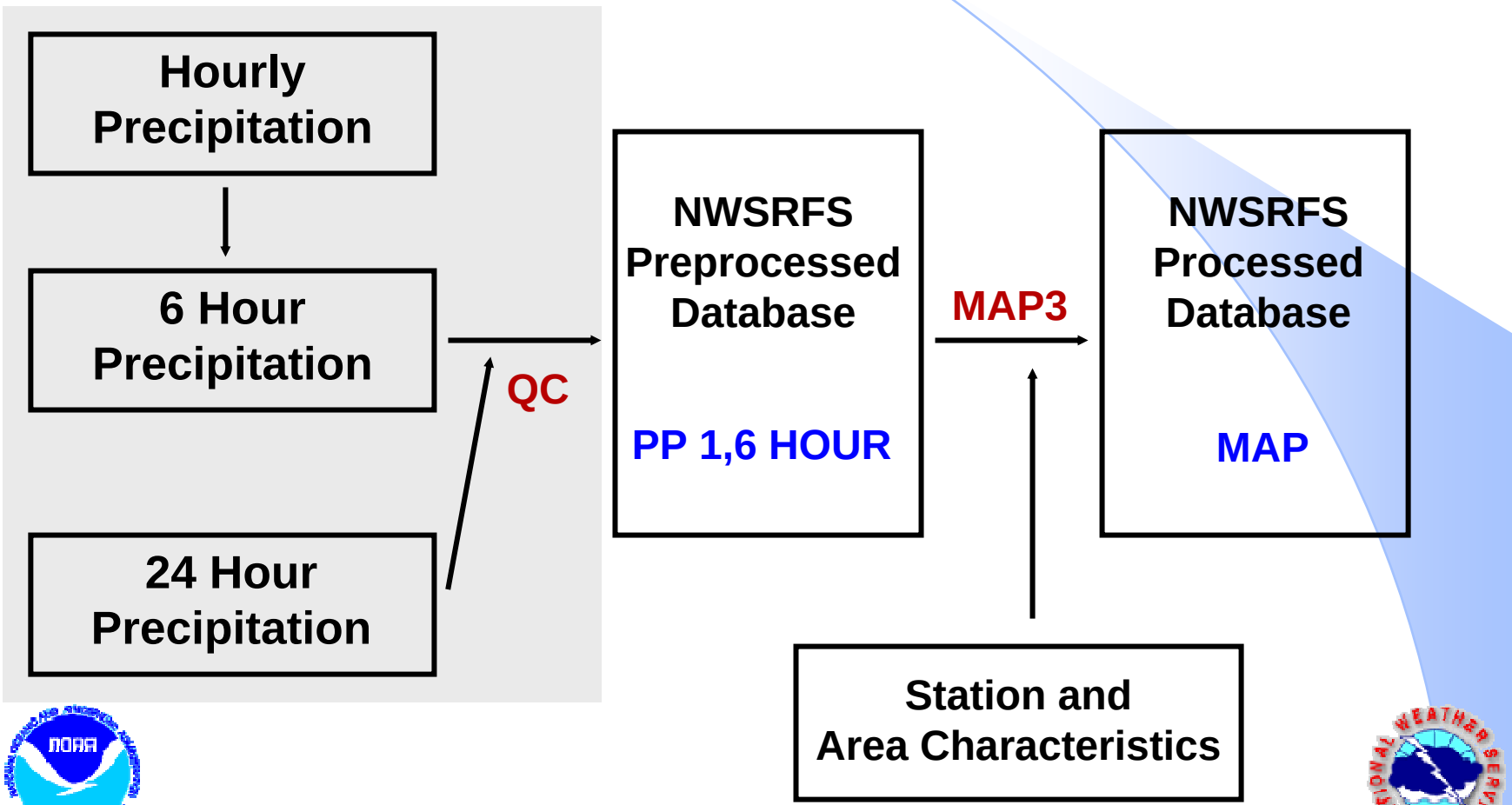
NWS Workshop on Hydrologic Forecasting
Prague Campus
Czech University of Agriculture
June 20-24, 2005



Pre-OFS Activities

- Collect, process, QC precipitation data.
- Collect, process, QC temperature data.
- Collect, process, river/reservoir data.
- Obtain, process forecast precipitation and temperature.
- Obtain anticipated reservoir regulation.

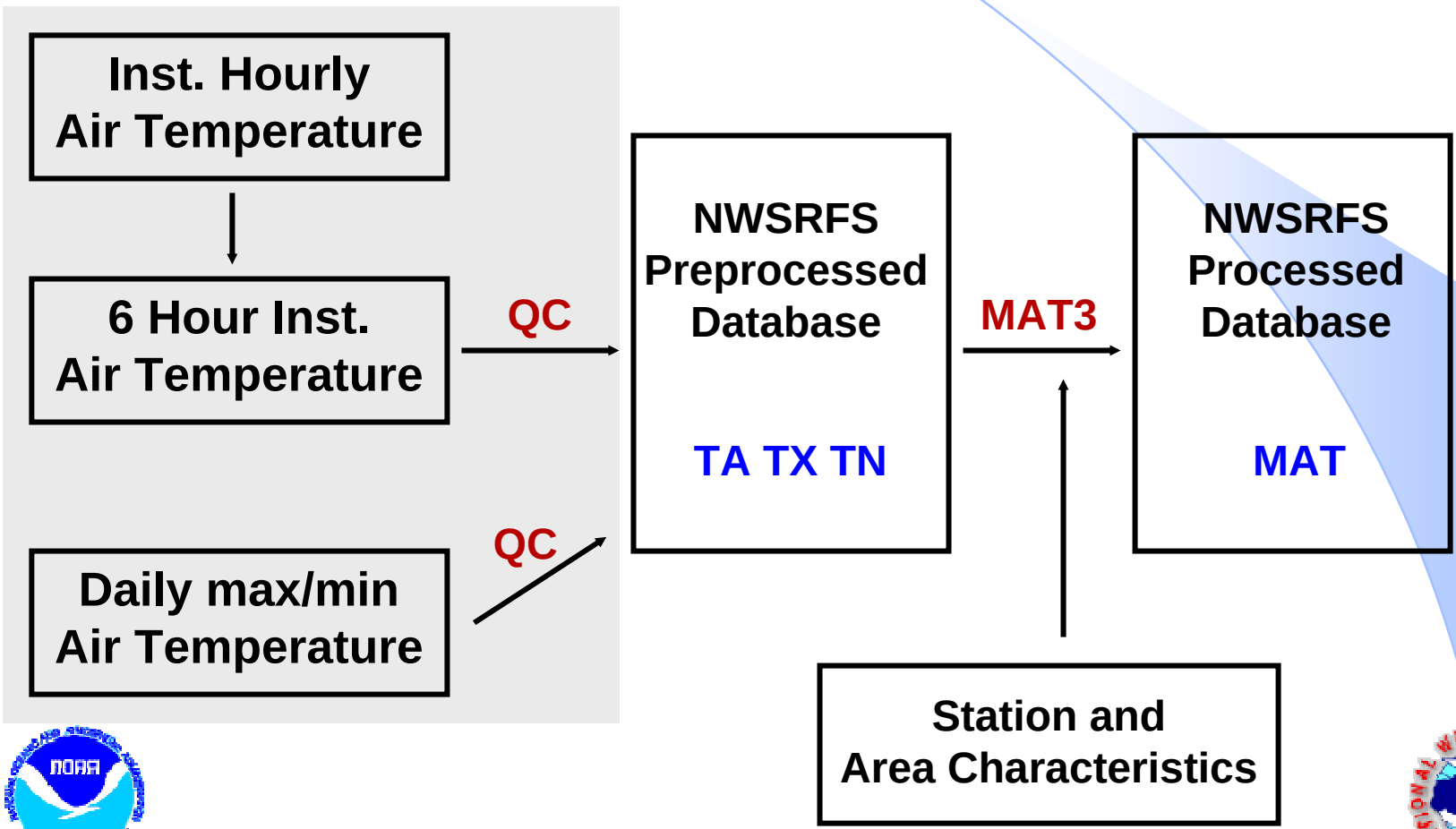
Mean Areal Precipitation (MAP)



Precipitation
Data Quality Control

- Every 1,6 hour period.
- Climatological normalization.
- Threshold and spatial comparisons.
- Systematic estimation.
- Manual forcing and over-rides.
- Output qualified for model use.

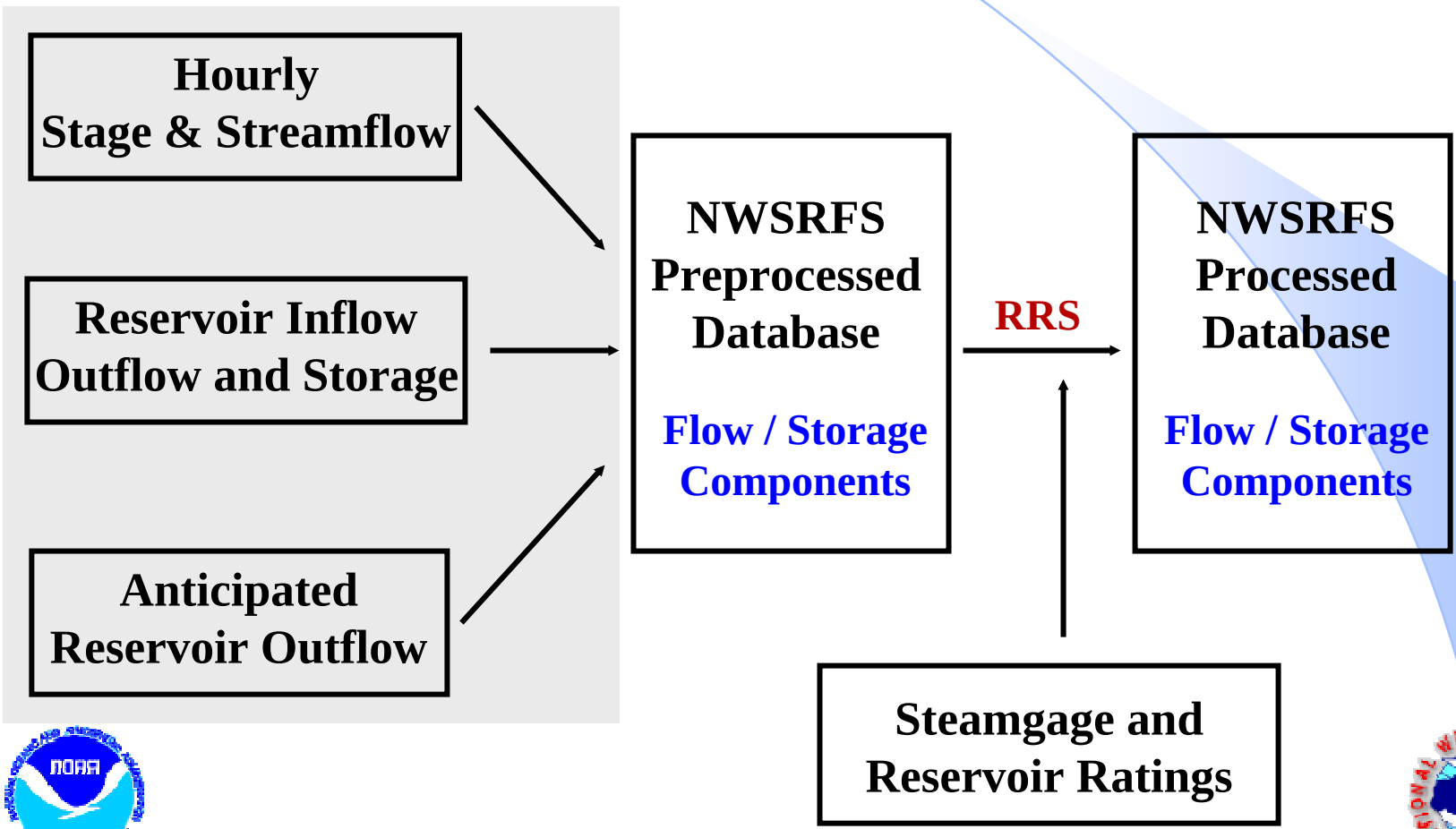
Mean Areal Temperature (MAT)



Air Temperature
Data Quality Control

- Lapse to mean observational elevation.
- Compute mean and standard deviation.
- Identify and estimate outliers and missing observations.
- Post validated observations and estimates for outliers and missing observations.

River and Reservoir Data (RRS)

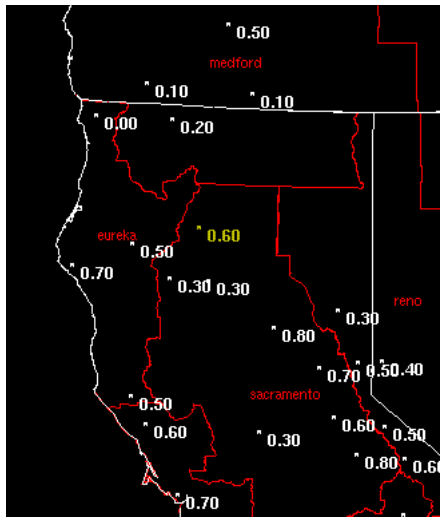


River and Reservoir Data Quality Control

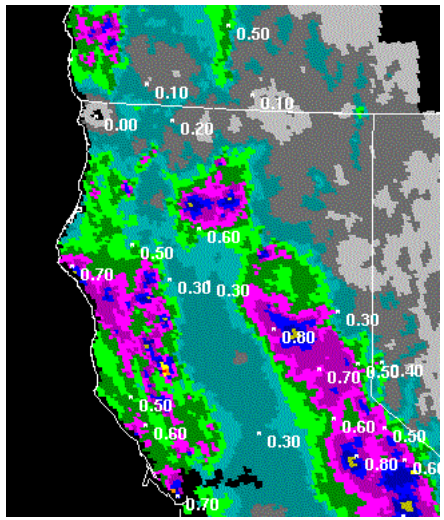
- No external system.
- Quality controlled in the context of simulated streamflow.

Quantitative Precipitation Forecasts

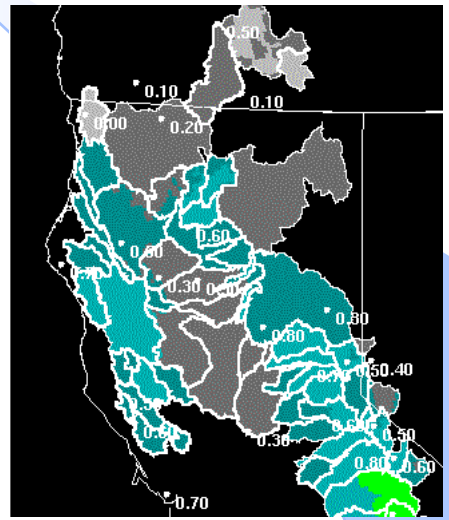
Points



Grids



MAPs



Climatological Normalization and Distance Weighting

Integration within Basin Boundaries

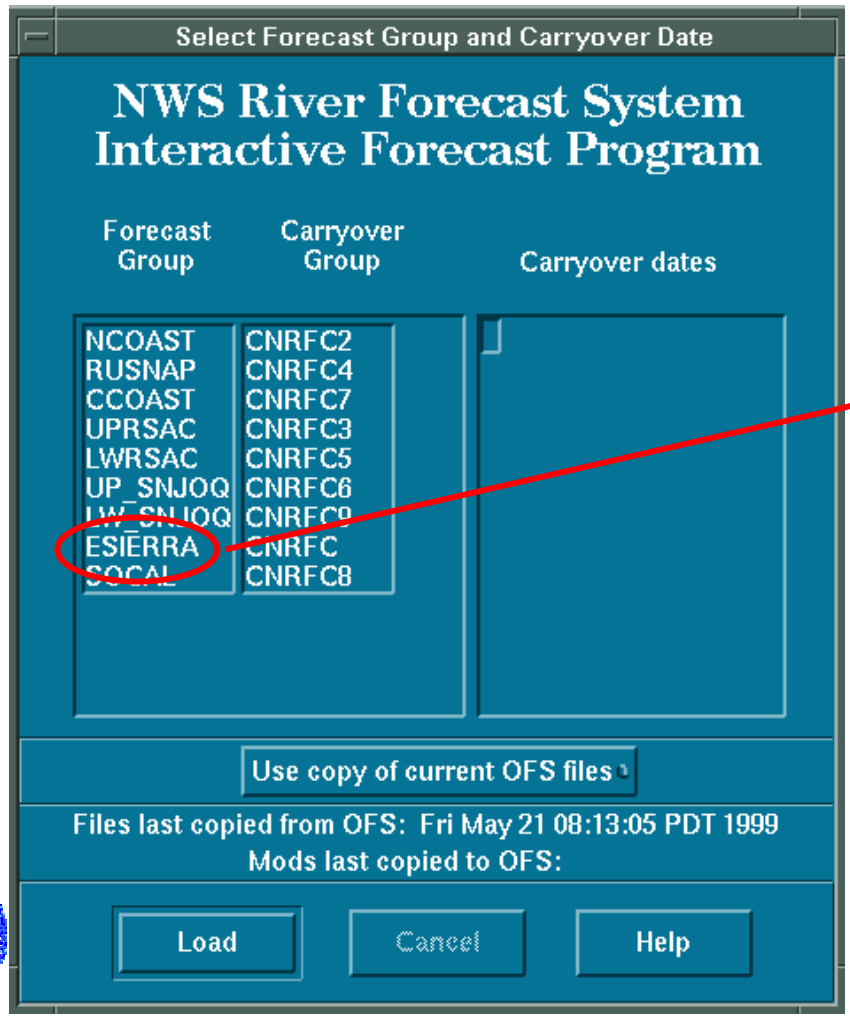
Forecast Mean Areal Precipitation

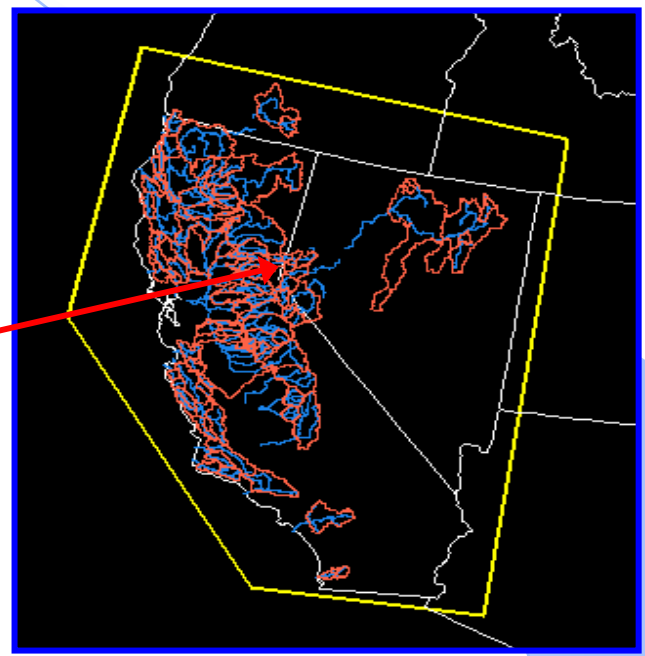
```
$East Side
MOD
.FMAP6 05219910PST
$              10   16   22   04     10   16   22   04     10   16   22   04
TAHFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
LFARFMAP    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
UFARFMAP    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
RNKN2LWL    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
RNKN2UPL    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
SCRN2LW     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
SCRN2UP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
VISN2LWL    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
VISN2UPL    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
WFCFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
LECFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
UECFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
STWN2LWL    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
STWN2UPL    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
LWWFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
UWWFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
LEWFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
UEWFMAP     0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0    0.0 0.0 0.0 0.0
ENDMOD
```

Forecast Rain-Snow Elevation

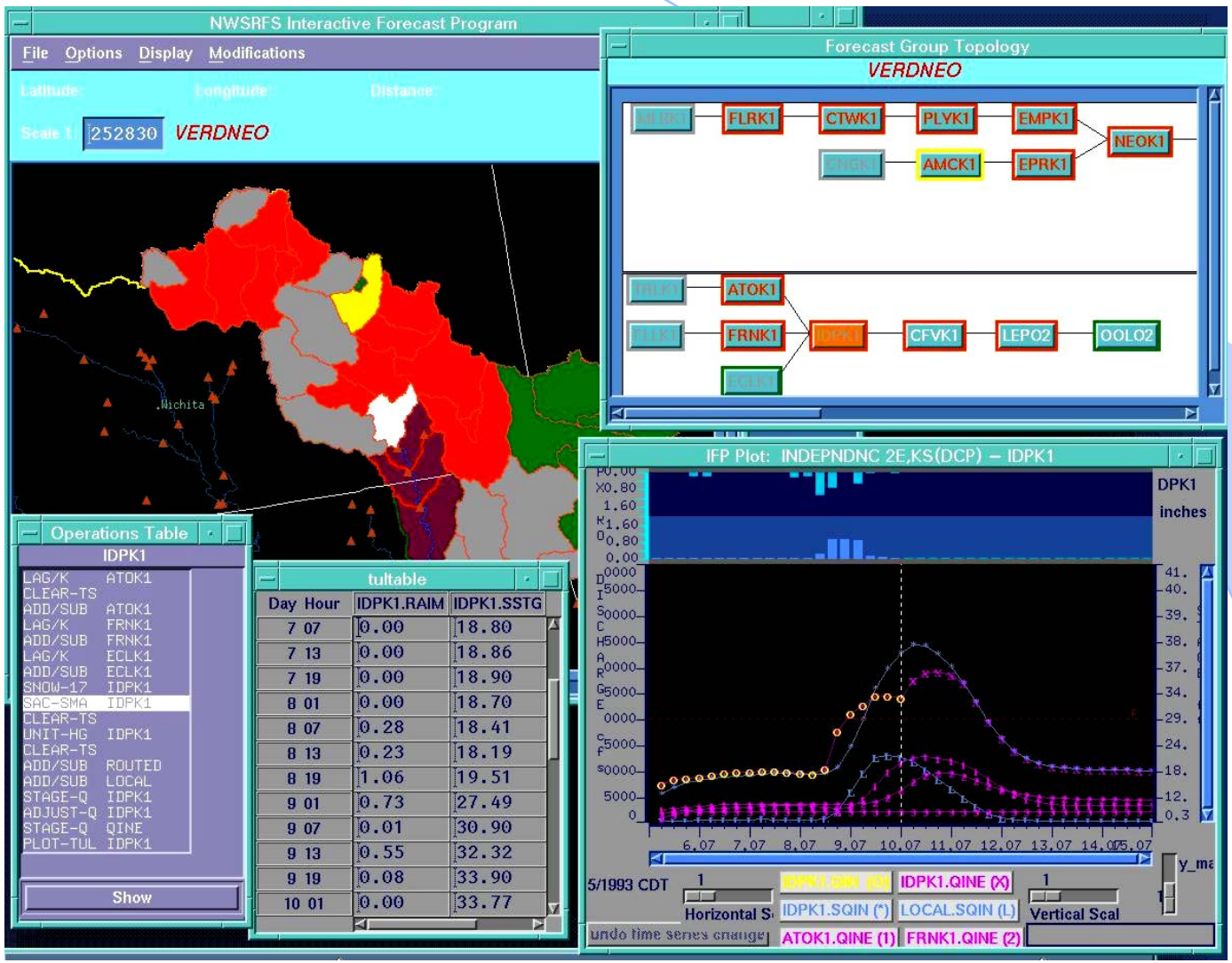
```
$East Side
.TSCHNG 05219910PST 05219910PST
TAHC1     TAHC1     RSEL   6   10700 11200 12500 13200  &
                               13700 14300 14600 14700  &
                               14700 14700 14800 13000  &
                               10900 10900 10900 11100  &
                               11100 11300 11300 11200     SNOW-17
FARC1     FARC1     RSEL   6   10700 11200 12500 13200  &
                               13700 14300 14600 14700  &
                               14700 14700 14800 13000  &
                               11000 11000 11000 11200  &
                               11200 11200 11200 11200     SNOW-17
RNKN2     RNKN2     RSEL   6   10700 11200 12500 13200  &
                               13700 14300 14600 14700  &
                               14700 14700 14800 13000  &
                               10900 10900 10900 11100  &
                               11100 11300 11300 11200     SNOW-17
SCRN2     SCRN2     RSEL   6   10700 11200 12500 13200  &
                               13700 14300 14600 14700  &
                               14700 14700 14800 13000  &
                               10900 10900 10900 11100  &
                               11100 11300 11300 11200     SNOW-17
```

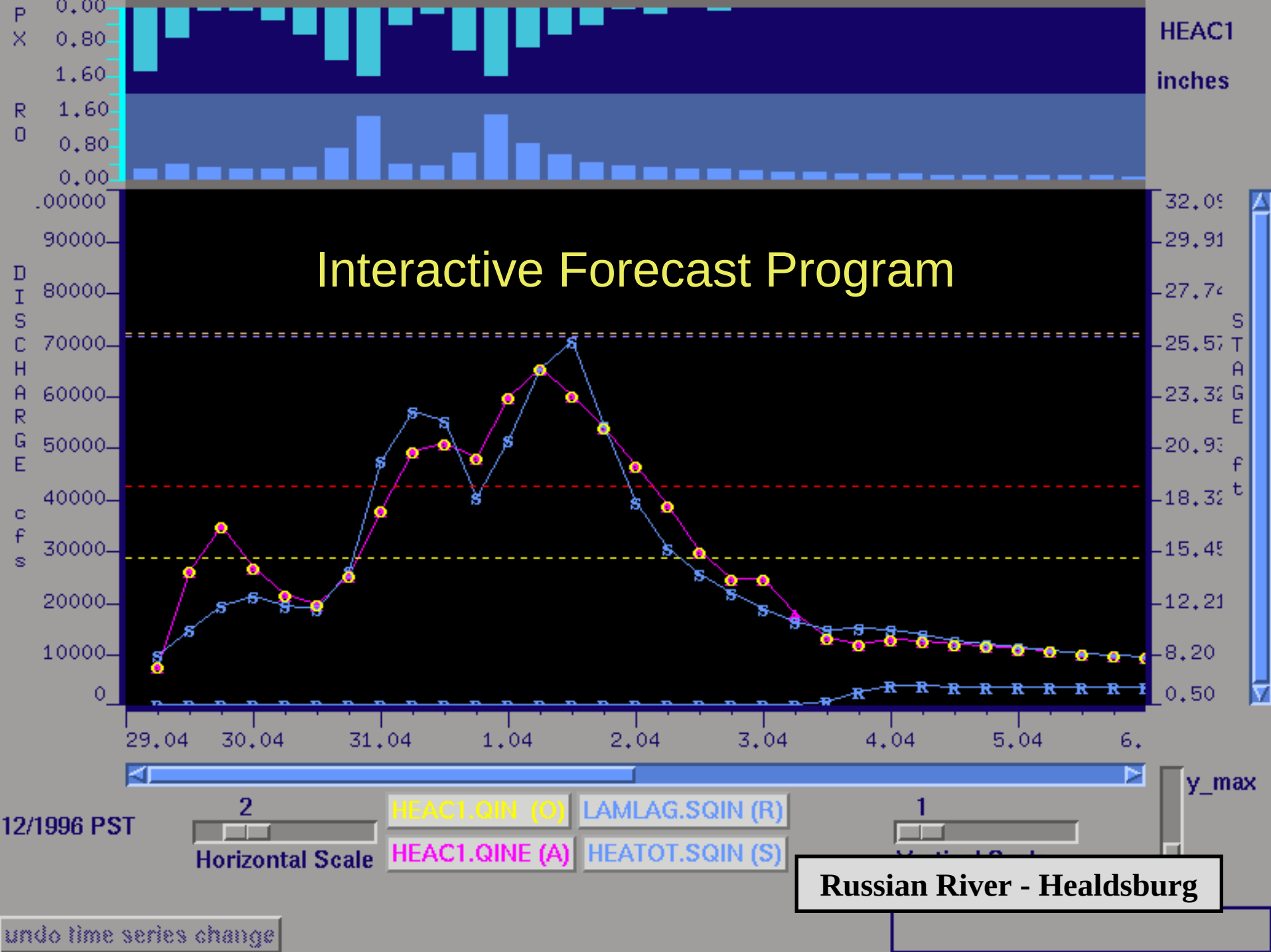
Interactive Forecast Program





Interactive Forecast Program



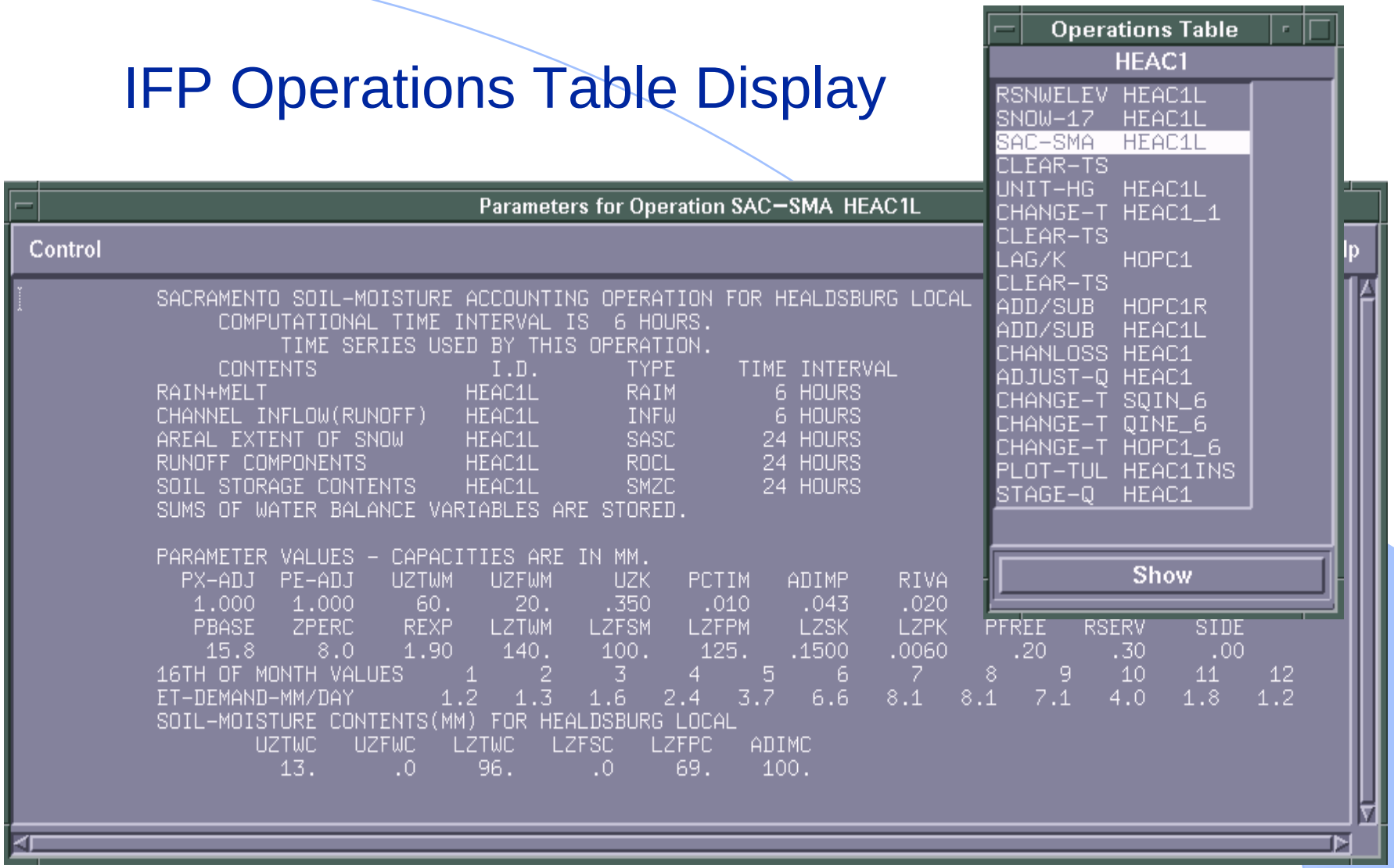

PX
0.00
0.80
1.60
RO
1.60
0.80
0.00
HEAC1
inches
Interactive Forecast Program
DISCHARGE cfs
.00000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
STAGE ft
32.09
29.91
27.74
25.57
23.32
20.93
18.32
15.45
12.21
8.20
0.50
29.04
30.04
31.04
1.04
2.04
3.04
4.04
5.04
6.
y_max
12/1996 PST
2
Horizontal Scale
HEAC1.QIN (O)
LAMLAG.SQIN (R)
HEAC1.QINE (A)
HEATOT.SQIN (S)
1
Russian River - Healdsburg
undo time series change

IFP Data Table

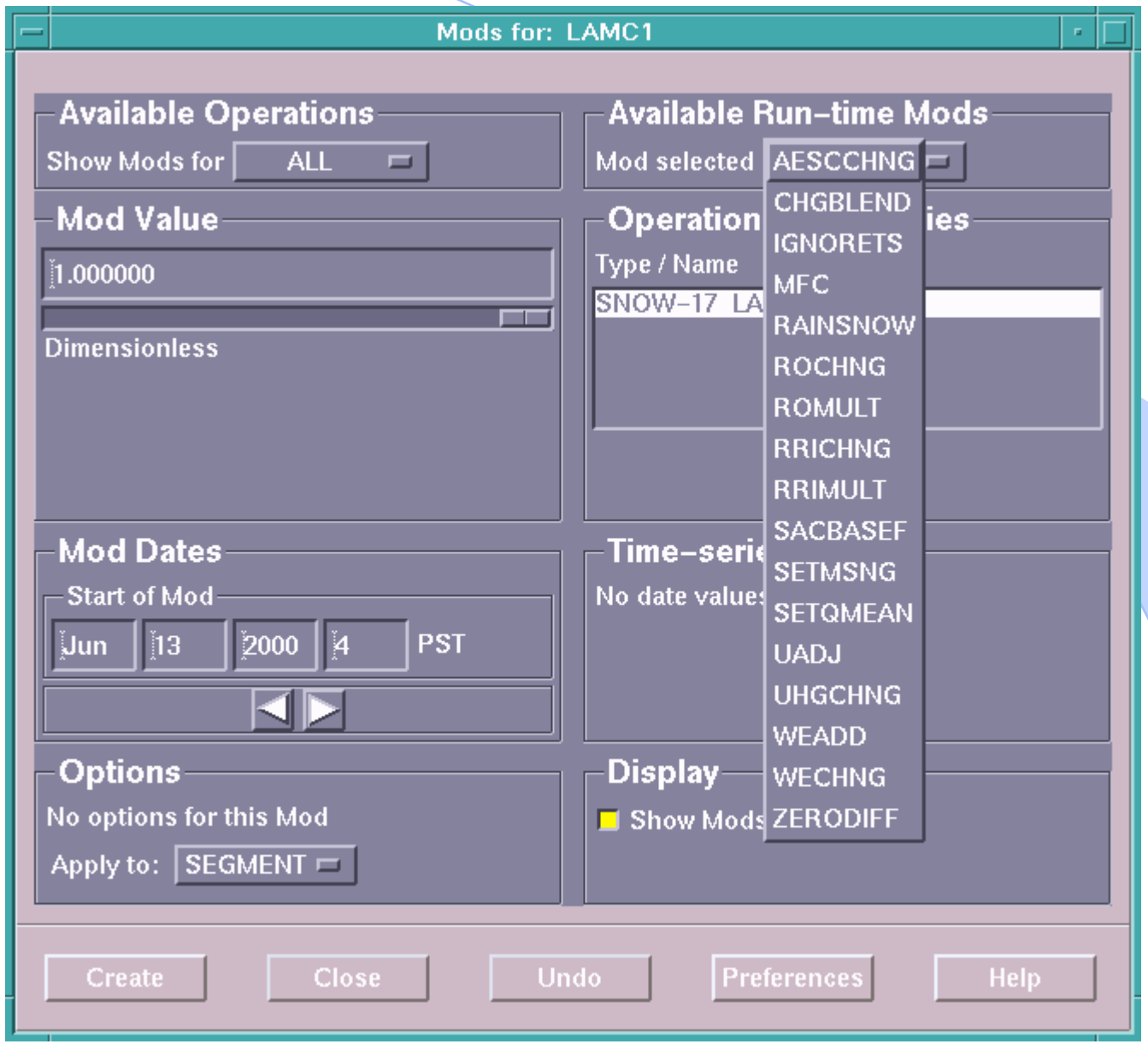
tultable

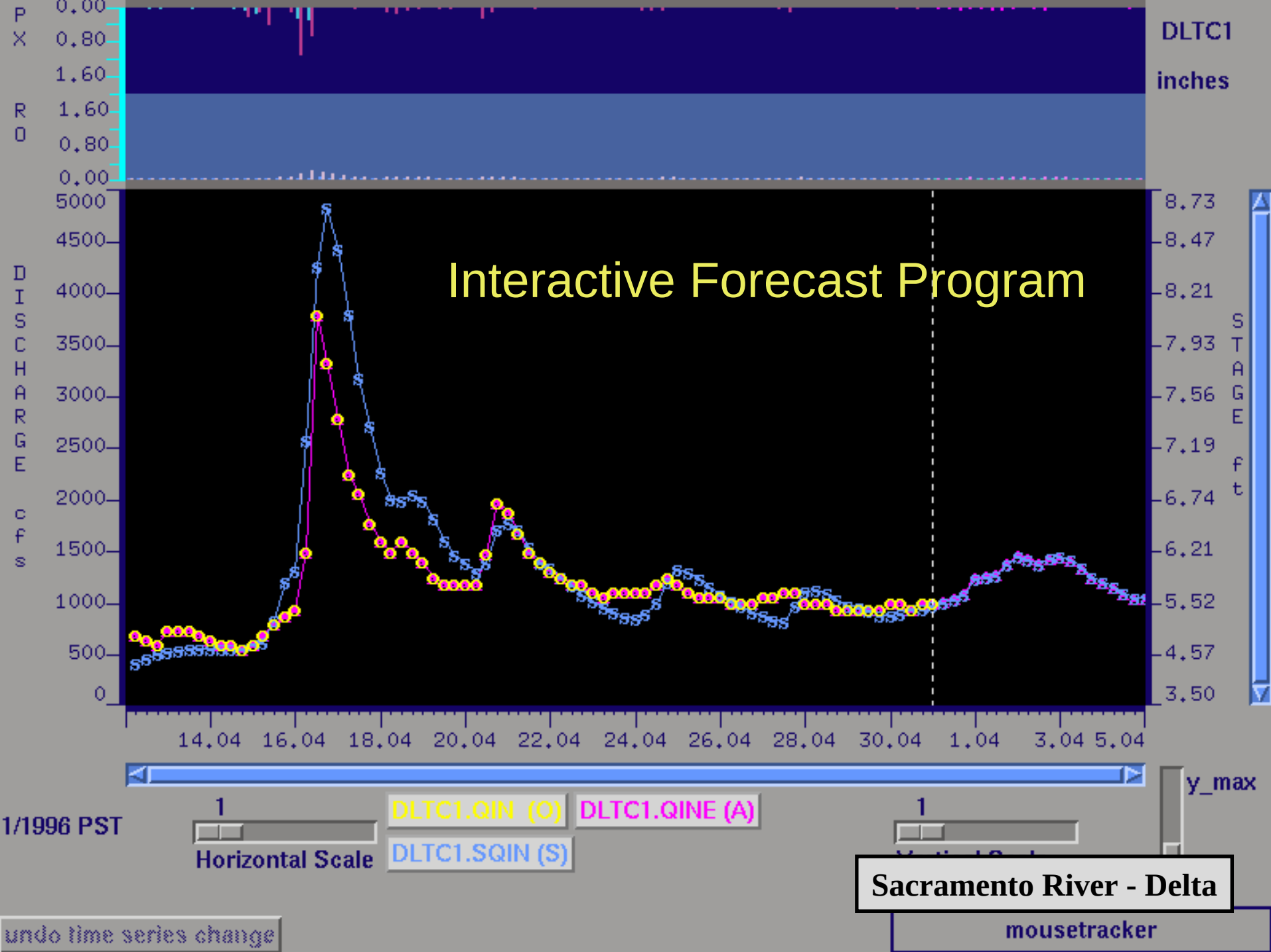
Day Hour	HEAC1L.RAIM	HEAC1.QINE	HEAC1.SQIN	HEAC1L.SQIN	HOPC1R.QINE	HEAC1L.MAP
10 04	0.00	340.00	277.10	143.43	210.00	0.00
10 10	0.00	350.00	276.47	142.80	210.00	0.00
10 16	0.00	340.00	265.77	142.09	200.00	0.00
10 22	0.00	340.00	265.15	141.48	200.00	0.00
11 04	0.00	330.00	256.14	140.92	193.55	0.00
11 10	0.00	330.00	262.00	140.32	200.00	0.00
11 16	0.00	320.00	261.30	139.62	200.00	0.00
11 22	0.00	330.00	270.69	139.01	210.00	0.00
12 04	0.00	330.00	268.14	138.46	210.00	0.00
12 10	0.00	330.00	267.55	137.86	210.00	0.00
12 16	0.00	340.00	266.85	137.16	210.00	0.00
12 22	0.00	330.00	266.24	136.56	210.00	0.00
13 04	0.00	330.00	273.69	136.00	220.00	0.00
13 10	0.00	330.00	263.10	135.41	210.00	0.00
13 16	0.00	328.90	262.40	134.71	210.00	0.00
13 22	0.00	337.89	271.79	134.10	220.00	0.00
14 04	0.00	334.95	269.25	133.55	220.00	0.00
14 10	0.00	334.56	269.26	132.96	220.61	0.00
14 16	0.00	335.00	270.10	132.26	222.15	0.00
14 22	0.00	333.19	268.70	131.65	221.35	0.00
15 04	0.00	330.05	265.96	131.10	221.15	0.00
15 10	0.00	328.90	265.21	130.51	220.99	0.00
15 16	0.00	327.73	264.45	129.81	220.93	0.00

IFP Operations Table Display

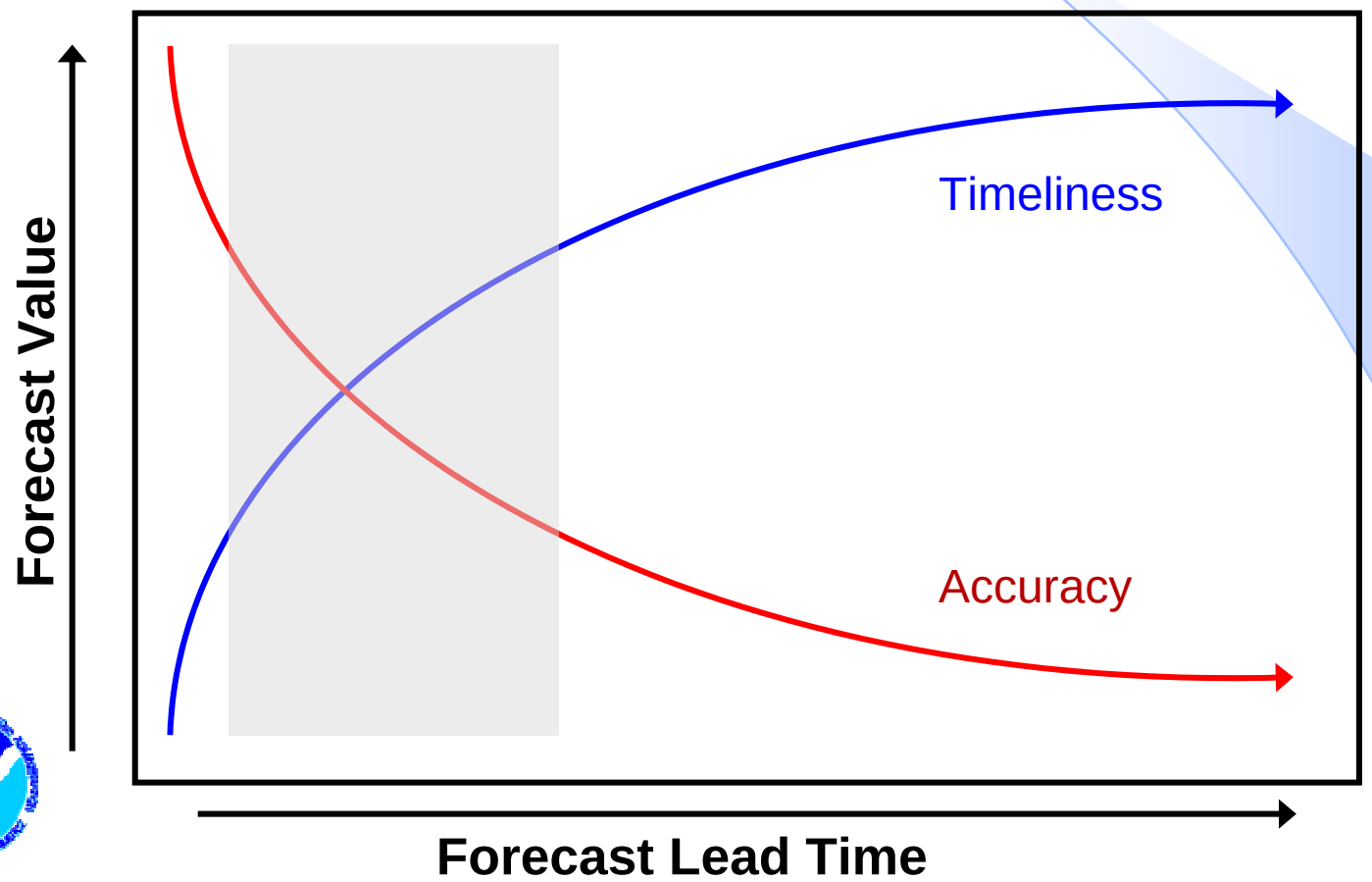


IFP Runtime Modifications




Interactive Forecast Program
DLTC1
inches
P
X
R
O
0.00
0.80
1.60
1.60
0.80
0.00
DISCHARGE cfs
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
STAGE ft
8.73
8.47
8.21
7.93
7.56
7.19
6.74
6.21
5.52
4.57
3.50
14.04
16.04
18.04
20.04
22.04
24.04
26.04
28.04
30.04
1.04
3.04
5.04
1/1996 PST
1
Horizontal Scale
DLTC1.QIN (O)
DLTC1.QINE (A)
DLTC1.SQIN (S)
1
y_max
Sacramento River - Delta
undo time series change
mousetracker

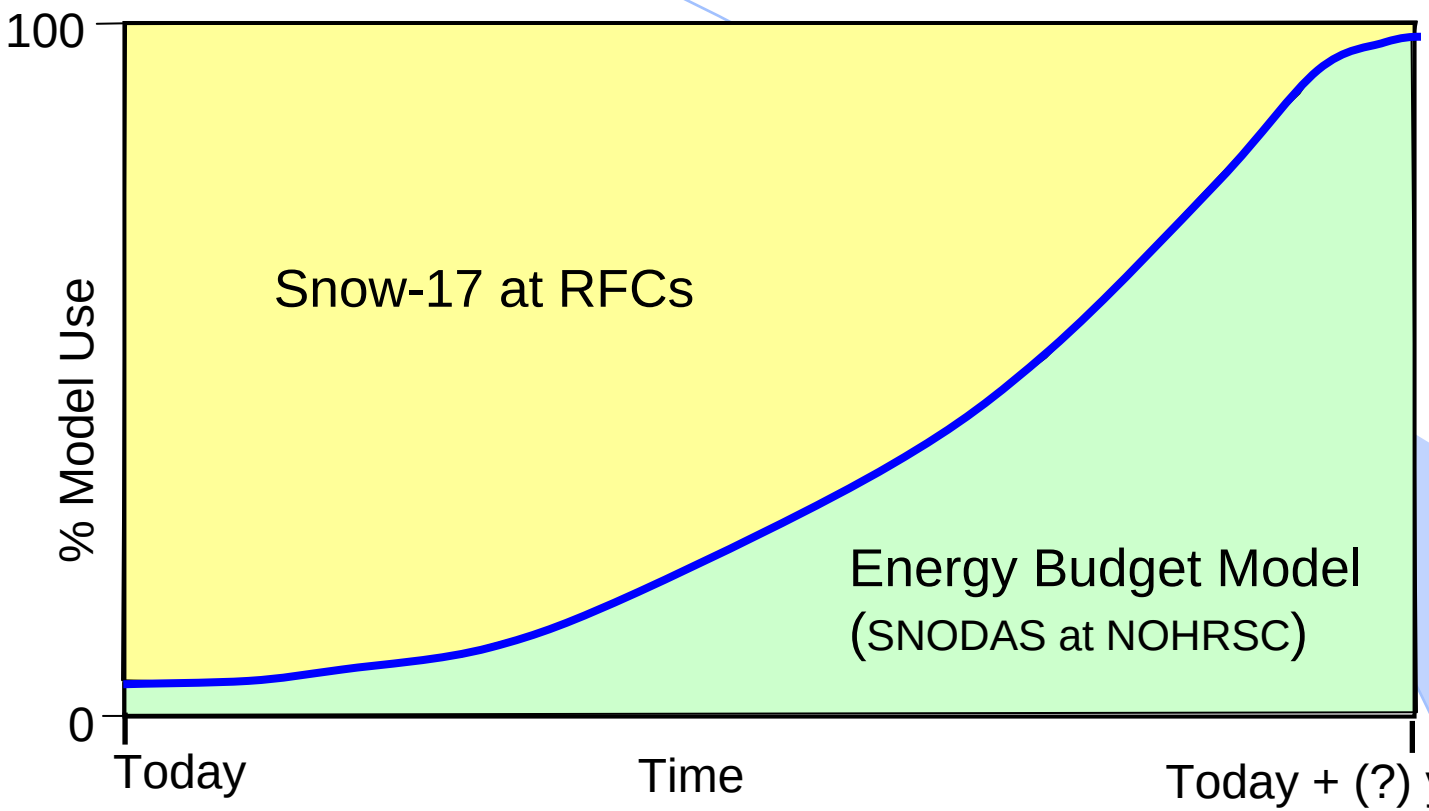
Balancing Timeliness and Accuracy



The End

Operational Forecast System (OFS)

Transition from Snow-17 to Energy Budget Model for RFC Operations: HL Activities



HL Activities

- Distributed Snow-17
- New data for Snow-17 (wind speed, etc)
- Sensitivity of Energy Budget model to data errors
- Snow-17 MODs based On Snodas
- Calb-OFS biases
- Use of Snodas Output in Snow-17
- Use of Snodas Output in runoff models